



## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 39

[Docket No. FAA-2021-0874; Project Identifier AD-2021-00668-E; Amendment 39-21892; AD 2022-01-04]

RIN 2120-AA64

#### **Airworthiness Directives; Rolls-Royce Corporation (Type Certificate previously held by Allison Engine Company) Turboprop Engines**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule.

**SUMMARY:** The FAA is adopting a new airworthiness directive (AD) for certain Rolls-Royce Corporation (RRC) AE 2100D3 model turboprop engines. This AD was prompted by an in-flight shutdown (IFSD) of an engine and subsequent investigation by the manufacturer that revealed a crack in the 3rd-stage compressor wheel. This AD requires replacement of the affected 3rd-stage compressor wheel. The FAA is issuing this AD to address the unsafe condition on these products.

**DATES:** This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** For service information identified in this final rule, contact Rolls-Royce Corporation, Rolls-Royce Meridian Center, 450 South Meridian Street, Indianapolis, IN 46225-1103; phone: (317) 230-1200; email: [defenseservicedesk@Rolls-Royce.com](mailto:defenseservicedesk@Rolls-Royce.com). You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 1200 District Avenue, Burlington, MA 01803. For information on the availability of this material at the FAA, call (817) 222-5110. It is also available at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0874.

#### **Examining the AD Docket**

You may examine the AD docket at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0874; or in person at Docket Operations between 9

a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, any comments received, and other information. The address for Docket Operations is U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

**FOR FURTHER INFORMATION CONTACT:** Kyri Zaroyiannis, Aviation Safety Engineer, Chicago ACO, FAA, 2300 E. Devon Avenue, Des Plaines, IL 60018; phone: (847) 294-7836; fax: (847) 294-7834; email: kyri.zaroyiannis@faa.gov.

**SUPPLEMENTARY INFORMATION:**

**Background**

The FAA issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 by adding an AD that would apply to certain RRC AE 2100D3 model turboprop engines. The NPRM published in the *Federal Register* on October 12, 2021 (86 FR 56660). The NPRM was prompted by an uncommanded IFSD of a RRC AE 3007A1 model turbofan engine installed on an Embraer S.A. model EMB-145 airplane (marketed as ERJ-145), while conducting a revenue flight. The manufacturer's investigation of this incident revealed that the IFSD resulted from a low-cycle fatigue crack in the dovetail slot for the blade attachment in the 3rd-stage compressor wheel, causing one 3rd-stage compressor blade to release. The crack initiated in the dovetail slot due to a sharp corner in the wheel slot geometry. The broaching process was identified as the cause of the crack and parts from this manufacturing lot required removal from service.

In response to this event and the manufacturer's subsequent investigation, the FAA issued a final rule; request for comments, AD 2020-16-13 (85 FR 45769, July 30, 2020), requiring replacement of certain 3rd-stage compressor wheels installed on RRC AE 3007A, AE 3007A1, AE 3007A1/1, AE 3007A1/2, AE 3007A1/3, AE 3007A1E, AE 3007A1P, and AE 3007A3 model turbofan engines before the 3rd-stage compressor wheels accumulate a specified number of cycles. The actions required by AD 2020-16-13 address engines that experienced high stresses at the 3rd-stage compressor wheel location and accumulated cycles at a high rate. In the NPRM, the FAA proposed to require replacement of certain AE 2100D3 3rd-stage compressor wheels that were produced in

the same lot as the AE 3007 3rd-stage compressor wheels identified in AD 2020-16-13, before they accumulate a specified number of cycles. The FAA is issuing this AD to address the unsafe condition on these products.

### **Discussion of Final Airworthiness Directive**

#### **Comments**

The FAA received comments from one anonymous commenter. The anonymous commenter supported the NPRM without change.

#### **Conclusion**

The FAA reviewed the relevant data, considered the comment received, and determined that air safety requires adopting the AD as proposed. Accordingly, the FAA is issuing this AD to address the unsafe condition on these products. Except for a minor editorial change to the contact address for service information, this AD is adopted as proposed in the NPRM.

#### **Related Service Information**

The FAA reviewed Rolls-Royce Alert Service Bulletin (ASB) AE 2100D3-A-72-330, Engine – 3rd Stage Compressor Wheel Removal for Reduced Life Limit, dated June 11, 2021. The ASB describes procedures for removal of a certain 3rd-stage compressor wheel.

#### **Costs of Compliance**

The FAA estimates that this AD affects 15 engines installed on airplanes of U.S. registry.

The FAA estimates the following costs to comply with this AD:

#### **Estimated costs**

<b>Action</b>	<b>Labor Cost</b>	<b>Parts Cost</b>	<b>Cost per product</b>	<b>Cost on U.S. operators</b>
Remove and replace 3rd-stage compressor wheel	125 work-hours x \$85 per hour = \$10,625	\$32,844	\$43,469	\$652,035

## **Authority for this Rulemaking**

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

## **Regulatory Findings**

This AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify that this AD:

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Will not affect intrastate aviation in Alaska, and
- (3) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

## **List of Subjects in 14 CFR Part 39**

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

## **The Amendment**

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

### **PART 39 - AIRWORTHINESS DIRECTIVES**

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

**§ 39.13 [Amended]**

2. The FAA amends § 39.13 by adding the following new airworthiness directive:

**2022-01-04 Rolls-Royce Corporation (Type Certificate previously held by Allison Engine Company):** Amendment 39-21892; Docket No. FAA-2021-0874; Project Identifier AD-2021-00668-E.

**(a) Effective Date**

This airworthiness directive (AD) is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**(b) Affected ADs**

None.

**(c) Applicability**

This AD applies to Rolls-Royce Corporation (RRC) AE 2100D3 model turboprop engines with a 3rd-stage compressor wheel, part number (P/N) 23084158, and with a serial number listed in Figure 1 to paragraph (c) of this AD.

**Figure 1 to Paragraph (c) – Serial Numbers of Affected P/N 23084158 3rd-stage Compressor Wheels**

L343502	L343539	L343545	L343546
L343547	L343550	L343553	L343554
L343555	L343566	L343569	L343573
L343576	L343578	L343579	L343580
L343584	L343588	L343593	L343594
L343597	L343602		

**(d) Subject**

Joint Aircraft System Component (JASC) Code 7230, Turbine Engine Compressor Section.

**(e) Unsafe Condition**

This AD was prompted by an in-flight shutdown of an engine during a revenue flight and subsequent investigation by the manufacturer that revealed a crack in the 3rd-stage compressor wheel. The FAA is issuing this AD to prevent failure of the 3rd-stage

compressor wheel. The unsafe condition, if not addressed, could result in an uncontained release of the 3rd-stage compressor wheel, damage to the engine, and damage to the airplane.

**(f) Compliance**

Comply with this AD within the compliance times specified, unless already done.

**(g) Required Actions**

Before the affected 3rd-stage compressor wheel exceeds 5,200 flight cycles since new, remove the affected 3rd-stage compressor wheel and replace with a part eligible for installation.

**(h) Definition**

For the purpose of this AD, a part eligible for installation is a 3rd-stage compressor wheel that does not have a P/N and a serial number listed in the Applicability, paragraph (c) of this AD.

**(i) Special Flight Permit**

A special flight permit may be issued in accordance with 14 CFR 21.197 and 21.199 to permit a one-time, non-revenue ferry flight to a location where the engine can be removed from service. This ferry flight must be performed with only essential flight crew.

**(j) Alternative Methods of Compliance (AMOCs)**

(1) The Manager, Chicago ACO, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or local Flight Standards District Office, as appropriate. If sending information directly to the manager of the certification office, send it to the attention of the person identified in paragraph (k) of this AD.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the local flight standards district office/certificate holding district office.

**(k) Related Information**

For more information about this AD, contact Kyri Zaroyiannis, Aviation Safety Engineer, Chicago ACO, FAA, 2300 E. Devon Avenue, Des Plaines, IL 60018; phone: (847) 294-7836; fax: (847) 294-7834; email: kyri.zaroyiannis@faa.gov.

**(l) Material Incorporated by Reference**

None.

Issued on December 21, 2021.

Lance T. Gant, Director,  
Compliance & Airworthiness Division,  
Aircraft Certification Service.

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